**Context:**Product recommendation systems are very important in enhancing customer behavior and experiences by suggesting relevant products based on records and preferences. Data mining plays a crucial role in recommending products. Apriori algorithm and clustering techniques are two powerful algorithms of data mining that help enhance the effectiveness and accuracy of these recommendations.

**Objectives:**The main objective of this paper is to develop enhanced product recommendation systems by using Apriori algorithms, FP-Growth, K-Means, K-Medoids, and Agglomerative Hierarchical Clustering approaches. The robust framework can identify frequent itemsets and discover association rules. It not only generates associations but also creates meaningful clusters to enhance recommendation accuracy.

**Materials/Methods:** This paper analyzes a transactional dataset using various algorithms including Apriori, FP-Growth, K-Means Clustering, K-Medoids, and Agglomerative Hierarchical Clustering. We also used hybridization among these to make association rules stronger. Association rules are generated based on the metrics (support, confidence, and lift). The Apriori algorithm identified key itemsets such as "Bread," "Cheese," "Milk," "Soda," and "Yogurt" with high support values, which were further clustered into distinct groups. FP-Growth confirmed these findings with additional rules. K-Medoids and Agglomerative Clustering revealed clear cluster formations, with items like "Chips" and "Eggs" forming separate groups due to lower support values.

**Conclusion:** The hybridization of FP-Growth algorithms with clustering techniques like K-Medoids and Agglomerative Hierarchical Clustering provides effective product recommendations. Frequent itemsets such as "Bread," "Cheese," "Milk," "Soda," and "Yogurt" form Cluster 1 with higher support values, while "Chips" and "Eggs" form Cluster 2 with relatively lower support values. Significant association rules included: [Cheese] → [Bread] with support 0.24, confidence 0.46, and lift 0.88 in Cluster 1. [Eggs] → [Bread] with support 0.30, confidence 0.60, and lift 1.15 in Cluster 2. Not only does it provide recommendations, but it also groups similar items, improving the accuracy and relevance of recommendations.